

Mineral Resource

Copper Mining in Arizona

by Dr. Madan M. Singh, Director

Water, water, everywhere,
And all the boards did shrink;
Water, water, everywhere,
Nor any drop to drink.

Samuel Taylor Coleridge
The Rime of the Ancient Mariner

The situation is similar in Arizona, not with water of course, but with copper. Arizona is fortunate to be blessed with a number of copper deposits, because of its unique geological history. Yet there is a great hesitancy among some citizens to mine it for the benefit of the state and country. In the case of a proposed copper mine near the town of Superior, the mayor of the municipality states, "They're offering to pump billions into the state, and people are acting like we don't need the money." In 2007 the United States imported 37 percent of the copper to meet its needs. Currently there is an emphasis on going green. Governor Janet Napolitano has repeatedly stated that Arizona should be the Saudi Arabia of solar power generation. The Solana Power Generating Station near Gila Bend is the first large such facility that is planned to be constructed in Arizona by Abengoa Solar. The plant will require several miles of 2-inch diameter copper pipe and 20 miles of 230 kilovolt transmission line. Wind projects are also heralded. It should be noted that wind farms need 4.5 times more copper than conventional power plants.

Some Arizonans are troubled about foreign-owned mining operations in the state. There seem to be few worries about the Solana plant or the only wind-energy farm that is currently being permitted, the Dry Lake Wind Project (to be developed by Iberdrola Renewables). Both of the companies are foreign-owned. In this day of globalization this is to be expected. In all cases the labor for construction and operation of the mines and plants is local and often a significant segment of the management and stockholders are U. S. citizens.

The need for copper in the future is expected to increase. As new solar plants and wind farms are built to supply power, there will be the need to supply copper for their construction. Such power generating stations will be located far from urban areas because of the necessity for large tracts of land. New transmission lines, using copper, will be required to bring the electricity to the cities and industrial developments. There is an emphasis on hybrid vehicles which demand more than twice as much

copper as conventional cars. Some new solar panel designs also use copper. The disinfecting properties of copper are now gaining prominence. In Arizona, the anticipated increases in population imply greater necessity for power.

The mining industry not only helps reduce foreign imports thereby ameliorating the economy, but is vital to national security. It should be borne in mind that mining in the United States is more environmentally rigorous than anywhere else in the world. Since air, water, and disease know no boundaries, it is better to mine in this country.

Copper Production Expanding

Three copper mines will soon be adding significantly to copper production in Arizona. Carlota is the second new major copper mine to open within a year; Mineral Park's new 25,000 ton per day mill has recently started production of copper and molybdenum concentrates; and Johnson Camp expects to be mining and leaching newly mined ore within the next quarter.

Carlota, owned by Quadra Mining Ltd., is located in the Miami District. Cathode copper production is expected to be approximately 50 million pounds in 2009. Increasing head grades are expected to result in an annual production of 70 – 75 million pounds in 2010. Construction was completed on budget and copper should be produced at Carlota by the end of this year. The mine, which will employ 220, has an expected 11-year mine life.

Mineral Park, located NW of Kingman, is owned by Mercator Minerals Ltd. Mercator has completed phase 1 of a two-phase expansion that will result in a 50,000 ton per day expansion. At full capacity, in 2009, the mine production is forecast to be 56.4 million pounds of copper, 10.3 million pounds of molybdenum, and 0.6 million ounces of silver. The leach SX-EW production continues during the expansion. A 25 year mine life is predicted.

Johnson Camp, owned by Nord Resources Corporation, is located east of Tucson. In mid-August of this year the mine received the air quality permit that was needed to proceed. Construction of the new crushing and screening circuit is underway with the mining of oxide ore expected in the first quarter of 2009. Cathodes will be produced from the expanded electrowinning tank-house. Anticipated production is for 25 million pounds per year over the mine's 16-year mine life. Production was resumed in January, 2008 from existing heaps.

Sustainable Development

All the major copper mining companies in Arizona – Freeport-McMoRan Copper and Gold, Inc., ASARCO LLC, BHP Copper, Inc., Resolution Copper Mining, LLC, Rosemont Copper Company, Quadra Mining Ltd. – are committed to sustainable development.

As an example, Resolution Copper is cleaning up an area affected by prior mining by other companies, and has committed over \$50 million for the project, of which \$15 million has already been spent. This will address a legacy problem that has plagued the state from times gone by when there was little appreciation for the need for reclamation by the mining companies as well as the communities in which the mines were located. The objective of this work is to restore the site to its natural vegetation, thereby improving the environment of the area and protecting the health of the local inhabitants. The land should then become usable for other purposes.

BHP Copper has spent over \$150 million to reclaim the San Manuel Mine and mill site. They plan to monitor the groundwater exiting the site for nearly a century. The company has the surrounding community involved throughout the restoration.

Similarly, Resolution has established excellent relations with the communities around their potential mine. They are cooperating closely with the town of Superior so that the area achieves its own objectives as to future development, both economically and socially. The company works on specific projects so that the region can develop a viable economy that is long-lasting. It is cooperating with the Arizona Department of Commerce to diversify the economies of the Copper Triangle. Resolution is keeping the public informed of all developments as regards the future mine. This is achieved by holding open meetings and having advisory committees comprised of local leaders. The firm has made philanthropic contributions and promoted educational and environmental institutions.

The proposed Rosemont mine will have a small footprint and will be strategically located to be shielded from view. It is planned to build a berm around the mine which will be planted with local vegetation. The reclamation will be concurrent with the mining to leave only the operating section of the mine exposed. The water, air and land will be protected and conserved. The company will adhere to local desert conservation plans. There will be an initial \$25 million community endowment with \$500,000 added annually during the mine operation; this will be managed by an independent local group.

Environmental Impact

A major concern on the part of the public often is the impact of mining on the environment. All mining companies that are planning to open new mines are subject to the same laws and regulations as any other industry. Some of these are mentioned below, but this list is not intended to be comprehensive.

- Antiquities Act, 1906, as amended
- Multiple Mineral Development Act, 1954, as amended.

- The Multiple Surface Use Act, 1955, as amended.
- National Environmental Policy Act (NEPA), 1969, as amended.
- Clean Air Act (CAA), 1970, as amended in 1977 and 1990.
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA), 1986.
- Federal Water Pollution Control Act, as amended by the Clean Water Act (CWA), 1972, 1977, and 1987.
- Hazardous Materials Transportation Act, 1975, as amended.
- Resource Conservation and Recovery Act (RCRA), 1976, replaced the Solid Wastes Disposal Act, 1965, as amended (Hazardous and Solid Waste Amendments, 1984).
- Federal Land Policy and Management Act (FLPMA), 1976, as amended.
- Safe Drinking Water Act (SDWA), 1982 as amended in 1987.

In addition there are:

- State Agency Statutes and Regulations (e.g. Arizona Department of Environmental Quality, Arizona State Mine Inspector, Arizona Department of Water Resources).
- Requirements for Reclamation.
- U.S. Bureau of Land Management (BLM) rules.
- U.S. Forest Service (USFS) laws.

In order to meet these requirements every mining company has to prepare an Environmental Impact Statement (EIS), a process that entails public participation and comment. All the potential environmental impacts need to be discussed in the document. It is in the best interest of the company to maximize the affirmative outcomes of the project and minimize any harmful consequences. The final report is available to the public.

Resolution Copper is currently conducting detailed baseline studies to determine the air and water quality, the existence of any endangered species, and presence of cultural artifacts, if any. Appropriate steps will be taken to protect or mitigate any potential harmful results.

The Rosemont deeded lands and unpatented claims lie between five and ten miles from the environmentally sensitive Davidson Canyon drainage area of Cienega Creek, which is associated with aquatic and riparian ecosystems. In order to avoid impacting the area, the mining company is purchasing water from the Central Arizona Project and pumping it into the Tucson Active Management Area. Five percent more water will be stored in the basin than is projected to be used by the mine, estimated at 100,000 acre-feet over the life of the mine. The biological resources in the affected area are being cataloged and will be protected. The existence of prehistoric sites is expected based on past archeological surveys; these cultural resources will be preserved. The quality of the air will meet all permit requirements.

Land Exchange

Large mines require land around their workings. If they do not own the entire property they want to acquire the rights. Freeport-McMoRan (at that time Phelps Dodge) obtained 16,297 acres administered by the U.S. Bureau of Land Management (encumbered with 844 mining claims and by buildings and facilities) for 3,867 acres of strategically-located, privately-owned by Phelps Dodge. The application for the exchange was made in 1994 but the final approval was forthcoming in 2005.

Phelps Dodge completed a land exchange for Morencí which took 5 or 6 years to consummate.

Resolution Copper is in the process of acquiring about 2,000 acres of National Forest land of which 695 acres will serve as an easement for Apache Leap, in order to protect that structure. In exchange, Resolution will transfer 5,500 acres to the United States, some of which lie along seven miles of the San Pedro River – an ecologically sensitive area. The remainder of the land is to protect endangered species, cultural resources, streams, and wetlands. The company has worked with the Nature Conservancy, Sonoran Institute, The Trust of Public Lands, and the Audubon Society to select the lands being given to the nation. It has also committed to support alternative campgrounds to replace the one on Oak Flat. Additionally, nearly 200 acres of land is being given to the town of Superior for development purposes. Superior will get title to the historic Fairview Cemetery.

Economic Benefits

In 2007 copper mining in Arizona contributed over \$6.8 billion to the economy of the state, both directly and indirectly, and resulted in 42,500 jobs for Arizona residents. State and local governments received \$385 million in revenues, and nearly 5,000 government employees around the state received their salaries because of taxes paid by the industry, directly and indirectly. Most of these worked for public schools, but many were in state government. Arizona produced 814,000 tons of the metal, which amounted to 62 percent of the copper mined in the United States. It may appear surprising but the direct impacts of the copper industry were \$1,173.8 million for Maricopa County and \$1,044.9 million for Pima County. All the other counties had minor impacts. Most of the copper produced in 2007 was by four companies – Freeport-McMoRan, ASARCO, BHP Copper and Mercator Minerals, Ltd.

According to a study by Elliott Pollack and Company, when Resolution Copper starts production, which is estimated to be 2019, its impact will be \$536.6 million per year. If the contributions of the development around Superior are also considered, the annual economic impact will be \$798.2 million. This will continue for the 66-year life of the mine. The total effect will be around \$46.4 billion! The State could certainly use that type of contribution. The local citizens are mostly in favor of the project. According to the Mayor of Superior "It's the best

thing that could happen to this town." State, county and local taxes will add up to \$10.7 billion. At its peak the mine will employ 1200 persons and 200 construction workers. If both direct and indirect jobs are considered, there will be over 2600 jobs, bringing \$178.7 million in wages to the workers.

The Rosemont mine and plant will contribute \$256 million (\$156 million direct and \$100 million indirect) to the economy of Pima County, as estimated by the Western Economic Analysis Center. The operation will create 500 jobs directly and 2,950 statewide jobs. During the 19-year life of the mine the total wages for the mine workers will be \$29 million annually and \$42 million per year for others in the County. The share of the economic benefits to Pima County will be \$16 million per annum, both direct and indirect. The economy of Arizona will benefit by \$488 million every year over the mine's operating life. The Sonoran Institute has challenged some of these benefits, but a detailed analysis of that work remains to be done.

National Economic Crisis

With the current state of the economy it would be negligent not to discuss this issue and its relation to mining in the United States and Arizona. The immediate cause of the meltdown is the subprime mortgage phenomena. This resulted, however, from the misguided belief that the nation could export most of its manufacturing capability and thrive on financial services. This in turn led to development of complex financial instruments and to easy credit. The results are evident. The country needs to produce goods to be able to export and cut back on the debt incurred. Even during the last few years the United States has depended on the sale of airplanes and armaments to offset some of the costs of goods purchased from China and oil from the Middle East. Although there is an emphasis on light rail for cheaper and more environmentally acceptable transportation, there is not a single plant in the country that fabricates light rail cars. These need to be imported. Now there is discussion of developing manufacturing for green technologies.

Dependence on mineral imports from foreign sources not only affects the economy, but also is critical for the nation's security. In 2007 the United States imported 100 percent of 19 minerals compared to 11 in 1997. Mining is an industry that can be retained in the country if the minerals exist and can be mined competitively. It would not be prudent to allow mining to follow in the footsteps of manufacturing. The President of the company at Resolution Copper Project, for example, says "What we're offering is an economic-stimulus package that won't cost taxpayers a dime." And the newly elected Congresswoman from the district considers the mine a "critical project that will inject billions of dollars into Arizona's economy and create thousands of jobs."

Minerals of Arizona Symposium

The 17th Annual Minerals of Arizona Symposium will be held on March 21, 2009 at the Arizona Mining and Mineral Museum. This event is co-sponsored by the Arizona Department of Mines and Mineral Resources and the Arizona Mineral and Mining Foundation.

This year's program is still being assembled, but will definitely include a presentation by Dr. Jan Rasmussen, Curator, entitled 'Wulfenite in Arizona.' Registration fees will include admission to the Museum. For more information contact Ray Grant, at 480-814-9086, after the first of the year.

NOTE: With the State budget cuts this year, the Department is preparing an e-mail listing to distribute our newsletter, *Arizona Mineral Resource* in that manner. To aid us in assembling that listing, we ask you to send your e-mail address to Sandra Regalado at azmines01@gmail.com

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